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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,204	09/22/2003	Gang Wang	031188	5746
23850	7590	03/23/2005	EXAMINER	
ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP			SEFER, AHMED N	
1725 K STREET, NW			ART UNIT	
SUITE 1000			PAPER NUMBER	
WASHINGTON, DC 20006			2826	

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

**Office Action Summary**

Application No.

10/665,204

Applicant(s)

WANG ET AL.

Examiner

A. Sefer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 December 2004.  
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-23 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) ☒ Claim(s) 1-16 is/are allowed.  
 6) ☒ Claim(s) 17-23 is/are rejected.  
 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☐ All b) ☐ Some \* c) ☐ None of:  
 1. ☐ Certified copies of the priority documents have been received.  
 2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_.  
 4) ☐ Interview Summary (PTO-413)  
 Paper No(s)/Mail Date. \_\_\_\_\_.  
 5) ☐ Notice of Informal Patent Application (PTO-152)  
 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Response to Amendment***

1. The amendment filed 12/22/2004 has been entered; no new claims have been added.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 17-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Buchanan et al. (“Buchanan”) US PG-Pub 2003/0211648.

Buchanan discloses in fig. 7 a semiconductor light-receiving device comprising: a semi-insulating substrate 1; a semiconductor layer 5 of a first conduction type that is formed on the semi-insulating substrate; a buffer layer 4g of the first conduction type that is formed on the semiconductor layer; a light absorption layer 4e that is formed on the buffer layer and generates carriers in accordance with incident light; a semiconductor layer of a second conduction type 3 that is formed on the light absorption layer; a high-concentration semiconductor intermediate tunneling layer 4f of the first conduction type that is interposed between the buffer layer and the light absorption layer having a higher impurity concentration than the buffer layer and a thickness and impurity concentration within the recited range (as in claim 19).

As for claims 18 and 19, the specification contains no disclosure of either the critical nature of the claimed arrangement or any unexpected results arising therefrom. Where

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patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

As for claim 20, Buchanan discloses a contact layer 5 of first conduction type interposed between the substrate and the buffer layer.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 17, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ajisawa et al. ("Ajisawa") USPN 5,825,047 in view of Viela et al. ("Viela") USPN 5,800,630.

Ajisawa discloses in fig. 6 a semiconductor light-receiving device comprising: a semi-insulating substrate; a buffer layer 64 of the first conduction type that is formed on the semiconductor layer; a light absorption layer 66 that is formed on the buffer layer and generates carriers in accordance with incident light; a semiconductor layer of a second conduction type 67 that is formed on the light absorption layer; a semiconductor intermediate layer 65 of the first conduction type that is interposed between the buffer layer and the light absorption layer, but lacks anticipation of a semiconductor layer of a first conduction type that is formed on the semi-insulating substrate or a semiconductor intermediate layer having a higher impurity concentration than the buffer layer.

Viela discloses in fig. 4 a semiconductor light-receiving device comprising: a semiconductor layer of a first conduction type (bottom layer) and a high-concentration semiconductor intermediate tunneling layer (third layer from bottom) having a higher impurity concentration than a buffer layer (second layer from bottom).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Viela's teachings with Ajisawa's device since that would produce a desirable characteristics of a tunnel junction as taught by Viela.

Regarding claim 21, Ajisawa discloses a light absorption layer 66 and the semiconductor layer of the second conduction type 67 form a mesa structure, with light entering the light absorption layer through a side surface of the light absorption layer that is exposed in a process of forming the mesa structure.

Regarding claim 22, Ajisawa discloses a semiconductor waveguide path formed on a semi-insulating substrate.

6. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe ("Watanabe") JP 6-90016 in view of Viela.

Watanabe discloses in fig. 5 a semiconductor light-receiving device comprising: a semiconductor substrate 21 of a first conduction type; a buffer layer 24 of the first conduction type that is formed on the semiconductor substrate and having a lower impurity concentration than the semiconductor substrate; a light absorption layer 26 that is formed on the buffer layer and generates carriers in accordance with incident light; a semiconductor layer 27 of a second conduction type that is formed on the light absorption layer; and a high-concentration semiconductor intermediate layer 25 of the first conduction type that is interposed between the

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buffer layer and the light absorption layer but lacks anticipation of the intermediate layer having a higher impurity concentration than the buffer layer.

Viela discloses in fig. 4 a semiconductor light-receiving device comprising: a high-concentration semiconductor intermediate tunneling layer (third layer from bottom) having a higher impurity concentration than a buffer layer (second layer from bottom).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Viela's teachings with Watanabe's device since that would produce a desirable characteristics of a tunnel junction as taught by Viela.

#### *Allowable Subject Matter*

7. Claims 1-16 are allowed.

#### *Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Sefer whose telephone number is (571) 272-1921.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ANS  
March 17, 2004

  
NATHAN J. FLYNN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800